35B Nightmute Standby Backup Power Plant
Final Closeout Summary Report
June 21, 2011

This Final Closeout Summary Report is filed with the federal grantor agency the Denali Commission ("Denali" or "DC") by the grantee partner Alaska Village Electric Cooperative, Inc. ("AVEC"). The federal grant awards affected by this report and by this project are: 0049-DC-2002-I2, 0098-DC-2003-I12, 170-05, and 349-07.

An initial project closeout report entitled "Award Transition and Closeout Summary" was submitted for this project on June 15, 2009. At the time, the project was still in construction under an active Denali award, 349-07. That initial, transitional closeout report was necessary because funds allocated to this project from the earlier Denali awards 0049-DC-2002-I2, 0098-DC-2003-I12 and 170-05, had been fully expended, and the awards had expired and were being closed. This final closeout summary report is being filed because the project is now complete, and because award 349-07 has also expired and is being closed. Federal funds in the amount of $140,099 are available for de-obligation from award 349-07 on this project.

The following report represents the project status as of September 30, 2010.

Background - Nightmute (population 250) is located on Nelson Island in remote western Alaska. It is 18 miles upriver from Toksook Bay and 100 miles west of Bethel. It lies at approximately 60° 28' N Latitude, 164° 44' W Longitude (Sec. 33, T005N, R088W, Seward Meridian). Nightmute is organized as a second class city and is located in the Bethel Recording District. Nelson Island has been inhabited by the Qaluyaarmiut, or "dip net people," for 2,000 years. The area has been relatively isolated from outside contact, and has kept its Yup'ik Eskimo traditions and culture. The Nightmute economy is a mixture of subsistence and cash-generating activities; employment is primarily with the city government, school, services, commercial fishing and construction. Trapping and crafts also provide cash income. Almost all families engage in either commercial or subsistence fishing, and most have seasonal summer fishing camps; 31 residents hold commercial fishing permits in the herring roe and salmon fisheries. Nightmute is influenced by a marine climate; precipitation averages 22 inches, with 43 inches of snowfall annually. Summer temperatures range from 41 to 57; winter temperatures are 6 to 24.

Activities - Project scope included installation of a new, single-unit modular generator enclosure that houses a single 344 kW capacity generator set. The module sits on a steel skid platform which rests on timber sleepers laid on grade. This generator provides emergency standby power to the community of Nightmute in the event of an intertie line failure or power plant shut down at Toksook Bay which normally supplies electricity to the community. The generator unit is equipped with required switchgear, day-tank, starting batteries, heating system, lighting system, transfer switch and controls necessary for automated start-up and operation when needed. Also included is a diesel-fired boiler that provides constant heat to the engine block and to the module during cold weather; this protects the equipment when startup occurs in such conditions. The boiler also heats an itinerant living quarters unit that was removed from the old power plant and placed next to the standby module. Finally, the scope included three 50 KVA step-up transformers; and the module yard is lighted and enclosed by a woven wire fence for security purposes.

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Initial planning for the project started in 2003, and an initial conceptual design report (CDR) was completed in March, 2005 by NANA Pacific that envisioned a set of new community energy facilities including bulk fuel upgrades (tank farm), new modular 800 kW power plant with heat recovery, and wind generation. At about the same time, a program change introduced the Toksook Bay - Nightmute intertie, which changed the power plant for Nightmute from primary to standby, with a generation capacity of 344 kW. Design responsibilities for this project and the Nightmute Bulk Fuel Upgrade project (Denali project 35A / 1173) were switched to Coffman Engineers (Coffman). A reconsideration of and major change in the preferred site delayed progress for over a year, culminating in Coffman's completion of a second CDR, considered an update of the first, in February 2007; a more detailed explanation of these events can be found in the Final Closeout Summary Report submitted for Denali projects 35A and 1173 (bulk fuel upgrades).

The two projects (bulk fuel upgrades and standby backup power plant) proceeded together. Site work and gravel pad construction was started in June, 2007. Construction-ready designs were approved in August, 2007. The standby generator was installed on its elevated steel platform in October, 2008.

Cost Containment - Funding was provided by Denali Commission grants to AVEC, and matching cash contributions from AVEC. Funding and costs are as follows:

Funding and Costs: Project 35B Nightmute Standby Backup Power Plant	**Federal Portion of award (DC)**	**Matching Portion (AVEC)**	**Total Funding (Budget)**		**Total Actual Costs**
DC award 0049-DC-2002-I2	$ 15,000		$ 15,000		
DC award 0098-DC-2003-I12	$ 264,987	$ 31,110	$ 296,097		
DC award 170-05	$ 67,557	$ 7,506	$ 75,063		
DC award 349-07	$ 237,594	$ 26,399	$ 263,993		
Total Funding (Budget)	**$ 585,138**	**$ 65,015**	**$ 650,153**		
DC award 0049-DC-2002-I2	$ 15,000				$ 15,000
DC award 0098-DC-2003-I12	$ 264,987	$ 31,110			$ 296,097
DC award 170-05	$ 67,557	$ 7,506			$ 75,063
DC award 349-07	$ 97,495	$ 10,833			$ 108,328
Total Actual Costs	**$ 445,039**	**$ 49,449**			**$ 494,488**
Funding in excess of costs	**$ 140,099**	**$ 15,566**	**$ 155,665**		

Total funding of $650,153 exceeds total actual costs of $494,488 by $155,665. 90% of this amount, or $140,099 is the federal portion and is available for de-obligation on award 349-07 on this project.

Design Generating Capacity (kW)	344 kW
Constructed Generating Capacity (kW)	344 kW

The completed, installed generating capacity is equal to the design capacity.

Budgeted project cost	$ 1,890 per kW
Final constructed cost (forecast)	$ 1,438 per kW
Denali Commission benchmark range	$ 3,500 – $2,900 per kW

The completed cost per kilowatt of generating capacity is $1,462 (about 50%) less than the Denali Commission cost containment benchmark for a complete diesel power plant of this size in this location.

Problems Encountered/Lessons Learned - The project suffered several time delays; 1) a major program change was made after a completed CDR has been prepared for an amalgamated energy facility upgrade for Nightmute, 2) a site change due to geotechnical problems, 3) a lengthy site control process, and 4) an insufficiency of gravel for the access road, generator site and community tank farm (separate project).

The gravel insufficiency resulted in having to import a limited amount of gravel by barge in 2008, and it delayed the construction by a season and added considerable cost to the construction phase. Poor geotechnical conditions were found at the site originally selected, and a higher-elevation site at a former borrow pit was selected as an alternate. However, full access and development of the borrow site required the acquisition of a portion of an adjacent Native allotment, which took nearly two years. A more detailed explanation of these events can be found in the Final Closeout Summary Report submitted for Denali projects 35A and 1173 (bulk fuel upgrades).

Outcomes and Conclusions - The program change to supply power from the diesel plant and wind generators in Toksook Bay via the intertie, and consequently to forgo a full modular power plant in Nightmute in favor of a standby backup generator only, is ultimately a very cost effective change. The facilities as constructed under this project meet all current regulations and codes governing electrical generation facilities of this size.

Bibliography:

NANA Pacific. *Conceptual Design Report, Final Submittal, Nightmute Bulk Fuel and Power System Upgrades.* Prepared for Alaska Village Electric Cooperative, Inc. March 11, 2005.

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Golder Associates, Inc. *Draft Geotechnical Investigation Bulk Fuel Upgrades Nightmute, Alaska.* Prepared for Coffman Engineers, Inc. December 21, 2005.

Golder Associates, Inc. *Technical Memorandum; RE Nightmute Standby Generator Module*. Prepared for Coffman Engineers, Inc. September 22, 2006.

Coffman Engineers, Inc. *Issued For Construction Drawings.* Prepared for Alaska Village Electric Cooperative, Inc. August 29, 2007.